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# NEBC MEETING NEWS

**September 1998.** The away meeting featured a presentation by Dr. Rudolf Schuster on the topic "Age, Reproduction and Distribution of the Hepaticae: Problems of Being a Haploid." He was introduced by Dr. Karen Searcy who noted highlights of his career, including a Ph.D. from the University of Minnesota in 1948, a professorship at the University of Massachusetts from 1960–1983, and authorship of six volumes entitled *Hepaticae and Anthocerotae of North America, East of the Hundredth Meridian.* Karen also noted that the University of Massachusetts herbarium holds many of Dr. Schuster's specimens from Massachusetts and just received on indefinite loan from Mt. Holyoke College a bryophyte collection from A. J. Grout, author of *Mosses with a Hand-Lens and Microscope*.

Another title for Dr. Schuster's talk might have been "Hepatic Paradoxes." Threaded throughout his presentation were observations of evolutionary, biological, and distributional twists or peculiarities about liverworts. We learned, for instance, that the group, while being very old, has not been very successful evolutionarily relative to many younger plant groups. In support of this he compared the approximately 5000–7000 species described for the Hepaticae, which have existed since the Devonian, with the 25,000 species of orchids, a group that originated around the start of the Tertiary. He speculates that the primarily haploid existence of hepatics versus the predominantly diploid life history of higher plants has been one of the chief limiting factors for the former. In hepatics, the diploid matures its spores while they are still enveloped by haploid tissues; thus there is no direct selection pressure on the diploid generation, he explained. Being nonvascular, the gametophytes are limited in size. The sporophytes, being basically parasitic on these "incompetent" haploid generation plants, are likewise fixed in terms of potential size and growth.

Another paradox of the Hepaticae is that they are considered long-term survivors yet they are frequently unsuccessful at sexual reproduction. A major problem for many hepatics is that all or most of their disseminated spores result in unisexual or totally vegetative clones. Over 95% of primitive taxa, he says, are unisexual; thus a single isolated spore can produce only a clone capable of maintaining itself by asexual means. An example given by Schuster is *Acrobolbus ciliatus*, which exists as male popu-

lations in Japan and female populations in the Southern Appalachians. A converse corollary among hepatics, it might be stated, is that many species or populations which exist as isolated unisexual clones are successful reproducers and often persist for eons. How do they accomplish this? Mainly by a variety of asexual forms of reproduction. For instance, among the 350–400 "good" species of *Plagiochila*, all are unisexual and many are known from one sex only. The Appalachian taxa reproduce mainly by fragmenting (e.g., *P. caduciloba*) or caducous leaves (e.g., *P. austinii*), a seemingly lousy way to get around, Schuster says, but then adds "maybe such fragments adhere to squirrel feet." Such fun thinking helped get us out of our anthropocentric mind sets in thinking about successful strategies for these small plants. Besides asexual disseminules, including gemmae in some taxa, some hepatics have the strategy of pure persistence, existing as hardy clones for centuries or millenia. For instance, *P. corniculata*, we were told, is waiting for sperm from male plants in Europe to make it across the Atlantic to fertilize the female clones in America. The genus *Haplomitrium* has evolved what appears to be a better game for overcoming lives of being unisexual clones lacking any asexual means of reproducing. Its taxa reproduce only by spores shed as diads or tetrads, which guarantees that at least some of the germinating diads and all of the tetrads will have the potential of producing gametophytes of both sexes in close proximity, and, therefore, at least the possibility of self fertilization.

A distributional paradox about Hepaticae is that while being a very old group, they have failed to spread well. Evidently, infrequent spore production, short spore viability, and other limitations to dispersal have restricted many taxa geographically. Oddly, Schuster points out, hepatics are poorly represented in geologically old areas such as the Appalachians in spite of their ability to persist as clones. All three endemic hepatic genera in North America, Schuster says, occur in orogenically young westernmost areas. Likewise in South America, the geologically old Guayana shield area has yielded only 3–4 endemic genera compared to at least 10–12 for the northern Andes. A partial explanation Schuster gives for this is that hepatics are basically pioneer taxa. In orogenically unstable sites, he suggests, there is persistence of old taxa plus opportunity for evolution to occur in newly created raw and diverse habitats. In geologically old areas, he speculates

there has been mass extinction of species through time plus a reduction of pioneer substrates where hepatics can easily grow and evolve.

—PAUL SOMERS, Recording Secretary